Export-led growth in Europe: Where and what to export?

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Abstract

From the late 70s onwards, the literature has produced numerous studies, mostly for developing countries, relating exports and economic growth. Since several European Union (EU) countries face strong recessions in the sequence of the economic crisis and the related fiscal consolidation measures, exports emerge as a meaningful source of growth for developed countries with rather stagnant domestic markets.

In this context, we assess if and how the product and the destination structures of exports shape the growth dynamics for the EU countries. Using panel data estimation to 23 of the 27 EU members over the period 1995-2010, we find that economic growth is foster through export specialization in high value-added products, such as manufactures and high-technology. Moreover, we find evidence that higher growth is fostered by export diversification across partners while enlarging the portfolio of partners, mainly to less developed and more distant countries, has negative impacts on European growth. Unambiguously, relative concentration of exports should be directed towards higher growth countries.

Keywords: Economic growth; Product structure of exports; Exports' destination; European Union; Panel data.

JEL classification codes: C23; F10; O40; O52.

Introduction

From the late 70s onwards, the literature has produced several studies relating exports and economic growth, although with an unclear unique-direction causal relationship. For the European Union (EU) countries, facing strong domestic recessions in the sequence of the economic and financial crisis and the related public debt correction measures, exports' growth emerges as a meaningful source of economic growth. Moreover, given that exports are a potential source of growth, a more refined analysis is in order: with a view to maximize the effects on growth, criteria on what and where to export may not be negligible. In this study, we aim at assessing if and how product and destination structure of exports shape the output growth dynamics for the EU countries.

Among the relevant literature, most studies focus on the Export-led growth (ELG) hypothesis, motivating and testing to what extent an increase in the volume of exports contributes to higher economic growth in the country of origin. In parallel, but to a rather small extent, there is some research that focuses, alternatively, on the product structure of exports or on the destination of exports as determinants of economic growth or/and exports' growth. In this context, our research contributes to the literature because it tests, simultaneously, how the product and destination structure of exports influences the economic growth in the country of origin. Additionally, and given the current environment constraints on the European growth prospects, our study relies on panel data estimation for the EU countries, whereas most of the collected literature on exports as a growth device applies to developing countries. Finally, we make an attempt to suggest export-supporting policy guidelines on where to and what should the European countries export.

The paper proceeds as follows. In section 1, we provide a review of the ELG hypothesis (briefly compared with the, alternative, "growth-driven exports" hypothesis) and an exhaustive review on how the product structure and destination shape economic growth and exports' growth. Section 2 presents data, methodology and the analysis of the estimation results. In section 3, we tentatively produce a note on export policy, given the current structure of European exports in terms of product and destination. Finally, we present the final remarks in section 4.

1. Export-led growth – a literature overview on the role of product structure and destination of exports

The link between exports and economic growth has been, for a long time now, an important and attractive area of research, widely explored in the literature (*e.g.*, Michaely, 1977, Balassa, 1978; Feder, 1983; Awokuse, 2008). Although the findings are not unanimous, a substantial amount of literature supports the export-led growth (ELG) hypothesis, both on theoretical and empirical grounds.

A first argument for the ELG is that "openness" enlarges market dimension, and an increase in production and sales arises as a result of higher demand pressure (Ramos, 2001; McCann, 2007; Hesse, 2008; Andraz and Rodrigues, 2010; Soukiasis and Antunes, 2011). Moreover, an expansion in exports may also promote specialization, particularly in the production of tradable goods, promoting a better reallocation of resources from (relatively) inefficient non-tradable sectors to higher productivity export-oriented sectors, while enabling comparative advantages; thus, as exports enlarge, domestic production rises through productivity growth (Awokuse, 2008; Andraz and Rodrigues, 2010; Soukiasis and Antunes, 2011; Lorde, 2011). Additionally, export effort involves facing stronger competitiveness which favors the exploitation of economies of scale and contributes to an acceleration of technical progress and a greater integration of production processes (Ramos, 2001; Awokuse, 2008; Andraz and Rodrigues, 2010). International trade is found to favor "spillover-effects" from technology and knowledge transfers (*e.g.*, Coe and Helpman, 1995, Keller 2004, Kali *et al*., 2007, Soukiasis and Antunes, 2011). Finally, export growth relaxes the external financial constraint of the country: it increases the potential demand of the economy and, consequently, increases the ability to save more and to capital accumulation; at the same time, it enables the country with larger capability to import intermediate capital goods. Both effects contribute to growth (Ramos, 2001; Awokuse, 2008).

Since we find significant theoretical and empirical support for exports to work as an engine of growth, a more refined analysis on the nature of this relationship requires a further review on detailed aspects of exports. The product structure and the destination of exports are often presented in the literature as non-neutral characteristics in driving economic growth.

1.1. Product structure of exports

A country cannot simply increase its exports to ensure economic growth since the composition and concentration of the exported goods are found to be also relevant factors (McCann, 2007 and Hausmann *et al.*, 2007, among others). The decision on what to export depends on production costs, specific costs of the product at the destination in question, market structure and consumer preferences and income (Amador and Opromolla, 2008); additionally, the pattern of product specialization is not independent of the level of development of the origin country (Spilimbergo, 2000).

The development, production and consumption of new goods (usually embedded with growth-delivering technology) are more likely to occur, first, in more advanced countries, arising only later in less developed countries (Stokey, 1991). On the demand-side, this is explained, for example, through the theory of product life-cycle according to which the demand for certain types of consumption goods is higher in countries with higher income (Vernon, 1966). On the supply-side, Grossman and Helpman (1991) argue that advanced economies are endowed with technological advantages, particularly when it comes to R&D. Thus, the more developed regions, rich in skilled labor and superior technology, producing (and thus exporting) more sophisticated goods, the greater is the potential for transmission of knowledge and skills and therefore to higher economic growth (Spilimbergo, 2000). Moreover, the export of more sophisticated goods also leads to more efficient management practices while stimulating innovation and technological advance (McCann, 2007).

In this sense, it seems relevant to analyze exports taking into account their technological component. One of the recent studies on this issue, Guaresma and Wörz (2005), tests the hypothesis that exports of high-tech industries have a greater potential for positive externalities and higher productivity (in terms of improved efficiency and economies of scale). They found evidence that there is a difference when considering exports disaggregated according to technological intensity: while technology-intensive exports have a significant positive effect on economic growth, exports of products with low technological intensity exhibit a negative effect on economic growth. The same study concludes that the better performance of high-tech exports is due to the difference in productivity relative to that in

the domestic sector arising from greater openness to foreign trade and from exposure to international competition. However, conclusions are different for developed countries compared to developing countries. For the former the results are not significant, only accruing positive growth effects to developing countries: marginal increases in capital, labor or exports, the rate of economic growth is greater the lower the level of development is (Balassa-effect as in McCann, 2007).

Some authors also disaggregate exports into commodities/natural resources and industrial and processed products. According to Herzer *et al.* (2004), there is evidence of a positive impact of manufacturing exports on economic growth, while exports of primary products exhibit negative impact on economic growth. Such findings can be interpreted as stemming from the effects of increased productivity associated with the industrial sector compared to those appending on primary goods (Herzer *et al.*, 2004). Countries that export goods with high levels of productivity benefit from faster economic growth (Hausmann *et al.*, 2007). It is also argued that, based on endogenous growth theory, the diversification of exports towards export more technology-advanced products, at the expense of "commodities", can contribute to positive externalities in other sectors (Herzer and Nowak-Lehmann, 2006). Greenaway *et al.* (1999) also test the impact of exports on GDP growth by disaggregating them into fuel, food, metals, other commodities, textiles and other manufactured goods. In contrast, they conclude that exports of fuels, metals and textiles to reveal important engine of economic growth, given the relative weight of the textile sector in developing countries and because metals and fuels represent inputs of great importance to most developed countries. Ziramba (2011), by decomposing exports into merchandise exports, net gold exports, export of services and income receipts, finds that real merchandise exports lead growth and that there is evidence of reverse causality in the case of service exports and income receipts. For net gold exports there is no causal relationship in either direction.

Another important issue for this analysis relates to product concentration in the exports portfolio. It will then be useful to know if it reveals more advantageous to specialize in certain products for export or whether it is more productive to diversify and invest in a wider variety of goods.

On the one hand, concentration of exports in certain products may allow economies of scale and enable the firms to move along the learning curve (Bebczuk and Berrettoni, 2006). For instance, the decrease in transport costs can lead to a reduction in the number of products produced domestically, thus promoting specialization (Dornbusch *et al.*, 1977). Hausmann and Rodrik (2003) emphasize that investors face significant uncertainty about the costs in the production of new goods: if they are successful, the gains will be for the whole society (information spillovers) but, in case of failure, losses will accrue to the private sector (investor). Thus, investment possibilities are withdrawn.

On the other hand, a diversification strategy ensures the stability of profits, leading the company to invest in some sectors related to its current portfolio (Bebczuk and Berrettoni, 2006), and also contributing to the stabilization of export earnings in the long run (Ghosh and Ostry, 1994). Moreover, it is also argued that diversification is an endogenous process that moves along with economic development: under certain assumptions, the Engel effects imply that higher income levels demand for greater economic diversity of consumption goods, forcing, consequently, producers to invest in a wider range of sectors (Acemoglu and Zilibotti, 1997). Additionally, one of the reasons, most frequently mentioned in the defense of diversification of exports, points to the knowledge transfer of new production techniques, management or marketing to new industries (Hesse, 2008). The instability of exports is another factor that contributes to the diversification of exports. Diversification will prove beneficial for less developed economies as "commodities" are too volatile to price changes; countries dependent on these products might, thus, suffer negative consequences due to excessive oscillation once the elasticity of demand is too small (Hesse, 2008). A final argument used by apologists of export diversification that countries must export goods for which world demand is increasing and that, regardless of a country producing more primary goods or manufactured, is the compatibility with the global demand that will determine the growth of its exports (Alexander and Warwick, 2007).

But export diversification prescription can differ in the context of more or less developed economies: the more developed countries tend to diversify their exports through innovate and invest in new technologies and not just by exporting a larger volume (Hummels and Klenow, 2005), while

developing countries tend to imitate and to export the products where they have a greater advantage, namely those related to natural resource abundance and/or low cost of manpower (Hesse, 2008).

Among the empirical literature, Al-Marhubi (2000) and Lederman and Maloney (2003) conclude for the positive impact of diversification of exports on economic growth. Some studies have, though, different conclusions when considering developed countries or countries at delayed phases of development (Hesse, 2008; Imbs and Wacziarg, 2000; McCann, 2007; Bonaglia and Fukasanu, 2003). Hesse (2008) and Imbs and Wacziarg (2000) conclude that specialization is beneficial for countries in more advanced stages of development while diversification is a best strategy for developing countries. In this sense, McCann (2007) and Bonaglia and Fukasaku (2003) also conclude that diversification is more important for developing countries and, thus, defend the these countries should be encouraged to diversify their exports to technologically more advanced sectors as to contribute to their economic growth. Note that this technological advance is recommended to occur in sectors where the country is already exporting before ("product proximity"), notably with regard to countries with abundant natural resources for example, forestry and mineral sectors have been proof of that, recording a significant development in terms of technologies used (Bonaglia and Fukasaku, 2003).

Despite the diversification of exports being pointed out by many authors as a determinant of economic growth (Bonaglia and Fukasaku, 2003; Herzer and Nowak-Lehmann, 2006; McCann, 2007; Hesse, 2008), there are some studies that find evidence that expertise in some sectors also may prove beneficial to economic growth, as is the case of specialization in the electronics sector (Amable, 2000) or in sectors with higher growth rates, generally more technologically advanced (Laursen, 2000; Guaresma and Wörz, 2005). Peneder (2002) also concludes that specialization in services represents a burden for future growth, while more technologically intensive exports have positive effects on economic growth. In this sense, Hausmann *et al.* (2007) argue that countries specializing in goods that richer countries export exhibit faster growth than those specializing in the production of other goods.

1.2. Destination of exports

The point that we want to explore next is the specific role of export destination on economic growth, an issue that the literature started to cover only recently and that still remains barely explored. Internationalization is of strategic importance since, for instance, the expansion into new markets is among the main decisions in the life of a company. This option is often related with cultural or social links with former colonies, the need for more trading partners (which are also, usually, former colonies) or the proximity to (large) external markets (Baliamoune-Lutz, 2011). Basically, the decision to enter a new market proves to be as important as the decision to create a new company (Amador and Opromolla, 2008).

In the literature we find a broad set of conflicting arguments in favor of destination diversification or for destination concentration. Moreover, and in particular, the literature also focuses on the optimal characteristics trade partners should exhibit.

A first set of arguments for destination diversification is related to the mechanism of technology and knowledge spillovers emerging from trade. To the extent that a country produces knowledge through research or experience, some countries generate more knowledge than others. In this sense, for the same export volume, the larger the number of trading partners, the greater the possibility of positive externalities resulting, namely, in terms of technology and exposure to new/different ideas (De Loecker, 2007). The adoption of new technologies helps to increase productivity and contributes to higher economic growth (Coe and Helpman, 1995).

Moreover, countries that export to a wider range of markets benefit not only because they face an enlarged and more diversified market to sell their products, but also because firms come across with new consumer's tastes, government regulations and other business environments (Lederman and Maloney, 2003).

Also, an increasing number of trading partners, resulting from the expansion of potential markets, attracts local and foreign investment which is shown to play an important role in technology diffusion and innovation and, consequently, in economic growth (Grossman and Helpman, 1991).

At the same time, the greater the diversity of trading partners, the stronger is the need for permanent development of innovations as to remain in a given market. Since fierce competition requires a continuous search for productivity gains, it impinges positively on economic growth (Kali *et al.*, 2007).

Furthermore, the diversification of trading partners reveals positive because it minimizes the risk of relying on a small number of export markets and, thus, reduces the export-dependency in case of idiosyncratic shocks (Baliamoune-Lutz, 2011).

However there are also arguments in favor of export concentration on a smaller number of countries. Concentration can help minimize the costs associated with insufficient commercial infrastructure such as ports, airports, diplomatic posts, among others (Kali *et al.*, 2007). Frankel *et al.* (1995), for example, point transportation costs as one of the main reasons for the emergence of specific trading blocks. Thus, when the infrastructure related to trade is not well developed, the concentration of trade destinies can help reducing transport costs (Kali *et al.*, 2007).

Besides the number of trading partners, the type of countries towards which exports are oriented to is also an important determinant for the role of exports in promoting economic growth. In this regard, the most obvious channel operates through external demand growth: the higher the average growth rate of the trading partners, the higher is their demand growth for imports, which directly contributes to a higher net exports growth of the country of origin (Arora and Vamvakidis, 2005).

Moreover, and since countries at different stages of development demand, on the one hand, for different products and, on the other hand, influence differently the country of origin through technological spillovers, the choice of where to export is not innocuous (Coe and Helpman, 1995). Additionally, and in this context, the choice of the menu of trading partners is rather limited: stating that "The G-7 countries accounted for about 84 percent of global spending on R&D in 1995", Keller (2004: 752) argues that knowledge is concentrated in a few countries.

Vacek (2010) finds that exports to more developed regions, which are pushing the world technological frontier forward, lead to higher productivity gains for the country of origin. On the one hand, exports

to customers in more advanced countries requires a greater degree of attention to product quality and/or deliverance time, meaning that companies continually seek to improve their performance by introducing innovations - improved methods of packaging and transport, adaptations to attract foreign consumers, product innovations, among others - (Kali *et al.*, 2007). On the other hand, the most advanced countries are endowed with a greater learning potential, more sophisticated production techniques, marketing and management strategies, and better design of inputs (Vacek, 2010). In this sense, establishing trade relations with countries in a more advanced stage of development favors the exporting country as it has access to a greater amount of knowledge (Damijan *et al.*, 2004) and may also benefit from the expertise of their buyers (Clerides *et al.*, 1998). Conversely, exports to less developed markets may lead to declining productivity, as an environment with fewer requirements for product quality and delivery timings would make exporters to become less efficient (Vacek, 2010).

However, the above results related to technology and other efficiencies spillovers are also sensible to the degree of development of the export-origin country. According to Kali *et al.* (2007), the marginal benefit of an additional trading partner is different for poor or rich economies. If, on the one hand, new technologies increase the productivity of older technologies, the effect of an additional trading partner on growth should be lower for a poor economy since it holds a smaller stock of knowledge to implement technological updates. On the other hand, the fact that the stock of knowledge is lower in poor countries, could imply that the contribution of an additional trading partner in terms of new knowledge (with impact on growth) is greater for developing economies. While these effects operate in opposite directions, both suggest asymmetric growth gains from trade accruing to rich and poor countries.

A final note is in order: Amador and Opromolla (2008) found that destination and product diversification of exports are both determinants of growth. Their study relies on micro-data and an analysis is made for the dynamics of export structure of companies located in Portugal, during the period 1996-2005. The authors conclude that multi-product and multi-destination firms are crucial in explaining the level and growth rates of Portuguese exports; in particular, firms exporting four or more

products and operating in four or more different markets are responsible for about two thirds of total exports. The authors also find evidence that growth in new markets is achieved mostly through the, simultaneous, introduction of new products in the firm's export portfolio.

Using a panel of more than 100 countries across four decades, Arora and Vamvakidis (2005) show that trading partners' growth has a strong effect on domestic growth. Trading partners' relative income levels are also positively correlated with growth, suggesting that the richer trading partners are, the stronger is conditional convergence. A general implication of the results is that countries benefit from trading with fast-growing and relatively more developed countries. Also, Baliamoune-Lutz (2011) concludes that where a country exports matters for the exporting country's growth and development. Performing Arellano-Bond GMM estimations using panel data over the period 1995-2008 to explore the growth effects of Africa's trade with China, she finds that there is no empirical evidence that exports to China enhance growth unconditionally but export concentration enhance the growth effects of exporting to China, implying that countries which export one major commodity to China benefit more (in terms of growth) than do countries that have more diversified exports.

2. The role of the structure of exports to the economic growth of the EU

2.1. Data and methodology

In this section, we estimate a simple export-augmented Solow-decomposition growth model in order to investigate the relationship between exports (including diversification of products and destinations) and real income *per capita* growth in the European Union. This framework is of rather widespread use in the literature (*e.g.*, Feder, 1983, Guaresma and Wörz, 2005, Hausmann *et al.*, 2007, and Dreger and Herzer, 2012). In particular, we estimate a panel growth regression using data for 23 EU countries from 1995 to 2010, following the standard panel-data specification in the literature:[1]

[1] Due to data restrictions, we have considered only 23 out of the 27 EU members: Austria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

$$Real\ per\ capita\ GDP\ growth_{it} = \boldsymbol{C}_{it} + \boldsymbol{\beta X}_{it} + \boldsymbol{u}_{it},$$

$$for\ i = 1, \dots, 23\ and\ t = 1995, \dots, 2010 \qquad (2.1)$$

The dependent variable is the average real *per capita* GDP growth rate; $\boldsymbol{C}$ is the matrix of constant terms (including potential cross-section and time effects); $\boldsymbol{\beta}$ is the matrix of parameters to be estimated; and $\boldsymbol{u}$ is the vector of error terms. $\boldsymbol{X}$ is the matrix of independent variables that includes variables of standard use in growth regressions:

- ***Population growth*** is measured by the growth rate of population, as percentage change on previous year;
- ***Gross capital formation*** consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories (measured as percentage of GDP);
- ***Inflation*** as measured by the consumer price. Inflation is often included as a macroeconomic stability control variable, usually impinging significantly and negatively on output growth (*e.g.*, Arora and Vamvakidis, 2004, 2005). Additionally, we kept this variable because inflation differentials are a measure of price-competitiveness for most of the countries in the sample, *i.e.*, the members of the European and Monetary Union.

In addition, $\boldsymbol{X}$ includes refined indicators of exports motivated by the mechanisms explored above:

- ***Number of partners*** is the total number of countries to where a country exports.
- ***Partner's growth*** is a constructed index capturing a weighted average growth rate of the main trading partners of each country in our sample (*i*). Based on total exports by destination, we first calculate the share of exports for each country in the total exports of the origin country. Then, we select *N* representative partners (those receiving more than 1% of total exports from the origin country). After that, we calculate the relative weight of each trading partner on total exports for the *N* representative partners (w_j). The index is defined as:

$$Partners'\ growth_{\ i} = \sum_{j}^{N} w_j . real\ per\ capita\ GDP\ growth_j$$

$$i, j = 1, \ldots, N,$$

and computed values are presented in Annex A. Arora and Vamvakidis (2004, 2005) also consider the real *per capita* GDP growth rate of trading partners but as a simple average.

- ***HHI-destination*** measures the exports' concentration among the trading partners as in Kali *et al.* (2007), where a low number indicates low concentration. It consists of a Herfindahl-Hirschmann concentration index for exports from country *i* to partner *j*, constructed as follows:

$$HHI - destination_i = \sum_j^N \left(\frac{X_{i \to j}}{\sum_j^N X_{i \to j}} \right)^2$$

where N and $X_{i \to j}$ denote the total number of trading partners and the total value of exports between countries i and j, respectively. It should be noted that even though the HHI-destination index described above is a function of the number of trading partners, these two variables are not necessarily related and, *a priori*, there should be no multicolinearity problem for the regression analysis.

- ***HHI-product*** refers to the product market concentration index; it is also a Herfindahl-Hirschmann index, taken directly from the Unctadstat database and defined as:

$$HHI - product_i = \frac{\sqrt{\sum_{p=1}^n \left(\frac{x_p}{X} \right)^2} - \sqrt{1/n}}{1 - \sqrt{1/n}}$$

Where x_p represents the value of exports of product$p$, X is the sum of exports of all products and n represents the number of products (SITC Revision 3 at 3-digit group level) for the country i.

To measure the impact on growth of the different types of products that a country exports we have disaggregated exports into three categories and construct, as Guaresma and Wörz (2005) and Kali *et al.* (2007), a weighted sector export growth rate:

$$Weighted\ exports_{is} = \frac{\Delta X_s}{X_s} \frac{X_s}{GDP_i}, i = 1, \ldots, 23, \qquad s = 1, \ldots, 3.$$

The three product-sector categories, *s*, respect to ***Food and agricultural exports***, ***Fuel, ores and metals exports*** and ***Manufactures exports***.

Additionally, we have also included a more refined indicator of high value-added exports:

- ***High technology exports*** measures the exports of products embedded with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery, as percentage of manufactured exports.

Values of real *per capita* and level GDP growth rates, population, product concentration index, exports by destination - to compute the number of partners, the HHI-destination and partners' growth - were extracted from the UnctadStat (http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx, accessed in May-June 2012). Data regarding gross capital formation, inflation, high-technology exports and product discrimination of exports (Food and agricultural; Fuel, ores and metals; Manufactures) were extracted from World Development Indicators (WDI), accessed in May-June 2012 at http://data.worldbank.org/data-catalog/world-development-indicators. General descriptive statistics for the sample are presented in Annex B.

2.2. Estimation results

Since our cross-section units are not random drawings from a larger sample (our sample covers 23 out of the 27 members of the European Union), the fixed effects model seems more adequate than the random effects model (Gujarati, 2004). In order to estimate the model we use the software *Eviews* that provides built-in tools for testing fixed effects against random effects, and also for testing the joint significance of the fixed effects, cross-section or/and time series. Table and Table below, report the tests made to sustain this choice.

Table shows the test for random effects using the "Hausman Test" for the two specifications chosen. The results strongly reject the null hypothesis that individual effects are uncorrelated with the other explanatory variables. Thus, the test points to the option for a fixed-effects model.

Table 1: Tests on cross-section random effects

Hausman Test	***Specification (I)***			***Specification (II)***		
	Chi-Sq. Statistic	*Chi-Sq. d.f.*	*Prob.*	*Chi-Sq. Statistic*	*Chi-Sq. d.f.*	*Prob.*
Cross-section random	42.790569	11	0.0000	48.491884	10	0.0000

Running the model under fixed-effects, the *Eviews* provides the test on the nature of the fixed effects (cross-section, period or both). Test results are presented in Table , below.

Table 2: Tests on cross-section and period fixed effects

Redundant Fixed Effects Tests	***Specification (I)***			***Specification (II)***		
	Statistic	*d.f.*	*Prob.*	*Statistic*	*d.f.*	*Prob.*
Cross-section F	**5.004684**	*(22,319)*	*0.0000*	**5.033668**	*(22,320)*	*0.0000*
Cross-section Chi-square	**109.114206**	*22*	*0.0000*	**109.364178**	*22*	*0.0000*
Period F	**2.791687**	*(15,319)*	*0.0004*	**2.887001**	*(15,320)*	*0.0003*
Period Chi-square	**45.389630**	*15*	*0.0001*	**46.707206**	*15*	*0.0000*
Cross-Section/ Period F	**4.207147**	*(37,319)*	*0.0000*	**4.360098**	*(37,320)*	*0.0000*
Cross-Section/ Period Chi-square	**146.249470**	*37*	*0.0000*	**150.224545**	*37*	*0.0000*

The first set consists of two tests ("Cross-section F" and "Cross-section Chi-square") that evaluate the joint significance of the cross-section effects using sums-of-squares (F-test) and the likelihood function (Chi-square test). The corresponding restricted specification is one in which there are period effects only. The two statistic values (5.00 and 109.11 for specification (*I*) and 5.03 and 109.36 for specification (*II*)) and the associated *p-values* strongly reject that cross-section effects are redundant.

The next two tests evaluate the significance of the period dummies in the unrestricted model against a restricted specification in which there are cross-section effects only. Both *F* and *Chi-square* statistics strongly reject the null hypothesis of no period effects. The remaining results evaluate the joint significance of all of the effects. Both test statistics reject the restricted model with common intercept.

Table shows the model estimation results for the two specifications chosen (*I* and *II*).

From the results we conclude that the model delivers a good fit, with the adjusted *R-squared* around 78% and a high overall significance of the independent variables (*F-statistics* close to 28). We can also see from the *t-statistics* (in specification *I*) that all variables are significant with the exception of ***Food and agricultural exports*** and ***fuel, ores and*** **metals** (***HHI-product*** is significant at 10.8% level of significance). Moreover, after controlling for ***High-technology exports***, and with the previous two exceptions, all the variables are significant.

Furthermore, with the exception of ***Number of partners,*** the signs of the coefficients associated with the independent variables are as expected from the literature. ***Gross capital formation*** and ***Population growth*** have the predicted effect on ***Real per capita GDP growth,*** with the first being positive and the second negative (Greenaway *et al.*, 1999; Arora and Vamvakidis, 2004; Arora and Vamvakidis, 2005; Kali *et al*., 2007; Hesse, 2008). As a measure of macroeconomic stability we use ***Inflation***, which have the predicted negative sign as Arora and Vamvakidis (2004, 2005) find. Higher inflation rates are associated with higher price volatility that causes difficulties to planning and, thus, depresses investment.

To analyze the impact of exports' destinations on economic growth we use three indicators: ***Number of partners, HHI-destination*** and ***Partners' growth***.

Table 3: Estimation results

	Specifications	
	(I)	*(II)*
Gross capital formation	**0.256905***	**0.267095***
	(5.085197)	*(5.181998)*
Population growth	**-1.450010***	**-1.707803***
	(-3.149617)	*(-3.733583)*
Inflation	**-0.057358***	**-0.059466***
	(-3.937974)	*(-4.166287)*
Number of partners	**-0.065456***	**-0.061757***
	(-3.623746)	*(-3.365770)*
HHI-destination	**-17.03450****	**-18.39811****
	(-2.175492)	*(-2.297597)*
Partners' growth	**1.336077***	**1.329256***
	(6.239717)	*(6.167562)*
Food and agricultural exports	**0.141395**	**0.093528**
	(0.600801)	*(0.388479)*
Fuel, ores and metal exports	**0.181282**	**0.158297**
	(1.167119)	*(1.018077)*
Manufactures exports	**0.119837***	**0.136047***
	(2.812646)	*(3.099850)*
HHI-product	**7.964254**	**9.280098*****
	(1.612176)	*(1.848063)*
High-technology exports	**0.079187*****	
	(1.874670)	
No. Observations	*368*	*368*
Adjusted R Squared	*0.776569*	*0.774125*
F-Statistic	*27.57434*	*27.76157*
Prob. (redundant cross-section/period fixed effects)	*0*	*0*

Notes: (1) Significant at 1% (*), 5% (**) and 10% (***); *t-statistics* in parenthesis.

(2) Estimations made under white-diagonal standard error correction for valid statistic inference.

The results obtained for the ***Number of partners*** suggest a negative impact on growth, a result strongly robust across all the specifications tested. According to our estimation, an additional trading partner decreases by 6-7 basis points the ***Real per capita GDP growth*** rate, keeping other things constant. The empirical literature mostly points to a positive influence to growth from an increasing number of partners but our sample is dominated by developed countries which, during most of this period have increased the number of poor countries as partners. According to Kali *et al*. (2007), the number of poor countries trading partners has a significant negative influence on the growth of rich

countries, as technology/knowledge spillovers are rather small (*e.g.*, Coe and Helpman, 1995, Keller, 2004). Moreover, this result for Europe apparently supports the view of meaningful transportation costs and or cultural/social barriers as European countries diversify to new markets.

We now turn the discussion of the effects that trade concentration (***HHI-destination***) has on economic growth. The estimated coefficients for this variable were negative and statistically significant. Kali *et al*. (2007) also use this indicator and find differences when they split their sample into a sub-sample of poor countries and one of rich countries. In their study this indicator was, for the most of the cases, considered positive and statistically relevant for both the total sample and the poor countries sub-sample. In contrast, for the rich countries sub-sample, the estimated coefficient was often insignificant and in some cases negative. As our sample is from the European Union, rich countries, the results seems to be consonant with *Kali et al.* (2007) because since the level of concentration increases as the ***HII-destination*** index increases, the results imply that poor countries benefit from more concentrated trade while the evidence for the rich countries is mixed at best. Based on the coefficients' value we can conclude that a variation of 0.1 units in ***HHI-destination*** generates a decrease of 1.7 *p.p* in ***Real per capita GDP Growth*** rate, keeping other things constant.

Overall, we argue that the combined results related to the ***Number of partners*** and the export-concentration in partner countries apparently suggest that destination of exports should be diversified enough in order to prevent for asymmetric external shocks on domestic growth, but the enlargement to distant (involving higher costs of transportation, more bureaucratic procedures, adjustment to different economic, social and institutional structures) and less developed trading partners reduces technology and knowledge spillovers.

Considering the indicator ***Partners' growth,*** the results are in accordance with the literature. We can conclude that a country benefits more from exporting to countries that experience higher real *per capita* growth rates. This result is expected because the higher the average growth rate of the trading partners, the higher is their demand growth for imports (Arora and Vamvakidis, 2005). The results show that a percentage point increase in ***Partners' growth*** increases by 1.34 *p.p.* the ***Real per capita***

GDP growth rate, keeping other things constant. Besides, establishing trade relations with countries in more advanced stages of development favors the exporting country as it has access to a greater amount of knowledge (Damijan *et al.*, 2004) and may also benefit from the expertise of their buyers (Clerides *et al.*, 1998). We have controlled for the average level of development of the trading partners (using the average GDP *per capita*) but results not reported showed that, across several specifications, this variable was highly insignificant and had a substantial negative impact on overall significance. Thus the level of development of the trading partners is not a relevant determinant of economic growth.

We now pay attention on the product structure of exports. To analyze the impact of different type of products exported, we have disaggregated merchandise exports into three categories: ***Food and agricultural***, ***Fuel, ores and metals*** and ***Manufactures.*** The results also seem to be reasonably in line with the literature. Although ***Food and agricultural*** and ***Fuel, ores and metals exports*** are not statistically significant, the signs are positive. Since the countries of our sample are not plenty of natural resources and demand for food tends to be income inelastic, it's not surprising that the coefficients on these fail to reach significance (Greenaway *et al.*, 1999). The results are stronger and according to the literature (Greenaway *et al.*, 1999; Herzer *et al.*, 2004) when we consider ***Manufactures***, products with higher value-added.

In order to better assess the impact of high value-added exports on economic growth, we add as an explanatory variable the ***High-technology exports,*** because many authors defend a positive impact of this on economic growth (see for instance McCann, 2007; Guaresma and Wörz, 2005; Spilimbergo, 2000); high value-added exports mainly reflect a more complex product structure which, *per se*, have stronger effects on growth. Our conclusions reveal to be consistent with the literature indicating that, a 93% confidence interval, a one percent increase in the weight of ***High-technology exports*** on Manufactures, increases by 0.08 *p.p.* the ***Real per capita GDP Growth*** rate, keeping other things constant (specification *I*). According to Guaresma and Wörz (2005) technology-intensive exports have a significant positive effect on economic growth and better performance of high-tech exports is due to the difference in productivity relative to that in the domestic sector.

Finally, regarding the overall product diversification, the HHI-product captures exports' concentration in terms of sector or product types. The results underlying the literature on this topic are ambiguous: some authors argue for concentration of exports while others refer that diversification benefits more the growth of the origin country. Our results suggest that, for Europe, exports' concentration has a positive impact on economic growth: an increase of 0.1 in ***HHI-product*** increases by 0.796 *p.p.* the ***Real per capita GDP Growth*** rate, keeping other things constant. According to Bebczuk and Berrettoni (2006), "the development-export diversification nexus, though, appears to be governed by a U-shaped pattern, whereby diversification increases at low income levels and concentration prevails at high income levels", which seems consistent with our country sample. Also Hesse (2008) and Imbs and Wacziarg (2000) conclude that specialization is beneficial for countries in more advanced stages of development while diversification is a best strategy for developing countries.

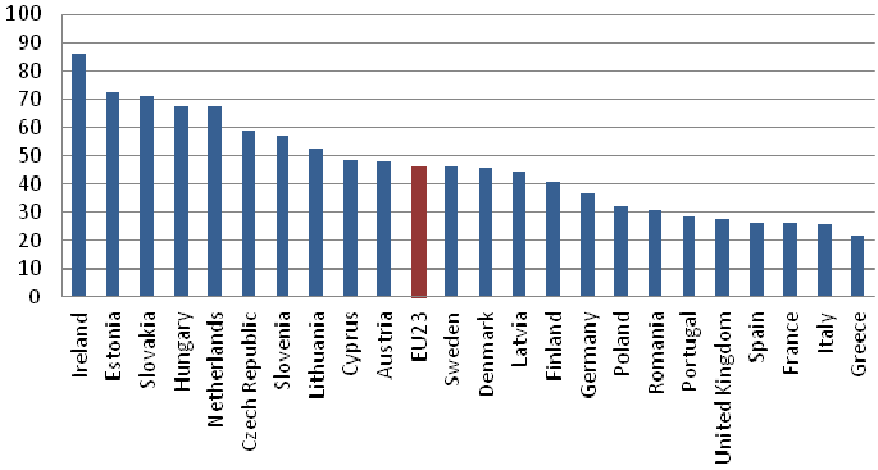
Since exports are a part of output through the expenditure identity, a positive and significant relationship between exports and output is almost inevitable, even if there are no productivity effects from exports. To add robustness to our results, we have run the growth equation under the two specifications but allowing, as in Dreger and Herzer (2012), for non-export *per capita* output growth as the dependent variable. Results are quite similar, except that weighted exports growth exhibit stronger effects, with ***Food and agricultural exports*** becoming statistically significant at 10%.

3. The structure of European exports and policy implications – a note

Using the results from the previous section, we intend to assess how the recent evolution of the exports structure has contributed to growth in Europe, aiming to draw a note on export.

Figure 1 shows that in Greece, Italy, France and Spain, for example, the exports represent a small percentage of GDP (between 21% and 26%). The EU23 average is 46.2%, well behind the leading countries - Ireland (86.3%), Estonia (72.3%) and Slovakia (71%).

Figure 1: EU23 - Exports by country (% GDP), average 1995-2010



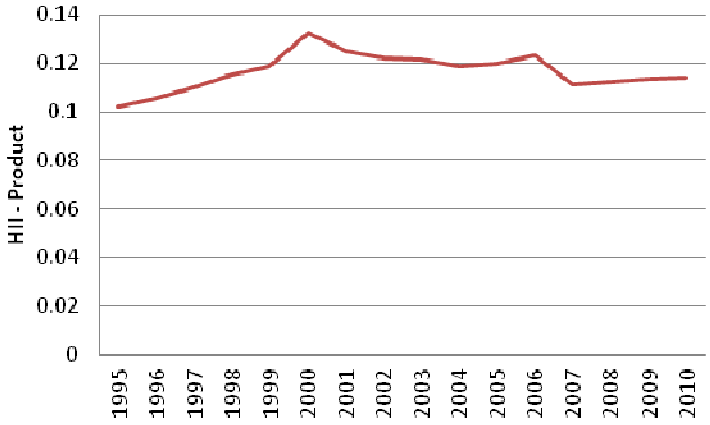
Source: World Development Indicators, accessed in June 2012 at http://data.worldbank.org/data-catalog/world-development-indicators.

Notes: 1) Exports of goods and services (% GDP)

2) Data refers to simple average across the EU23 countries.

As for the product concentration of exports (Figure 2), the evolution of the HHI for product type in Europe has been irregular and reached a maximum value of 0.13 in 2000, being currently around 0.11. Relatively to 1995, there is now a higher value for this index, representing a stronger concentration of exports in certain sectors/products. According to the results of our model, the trend towards further product concentration, reinforcing comparative advantages and economies of scale, has contributed positively to European growth.

Figure 2: EU23 - Product concentration of exports, 1995-2010



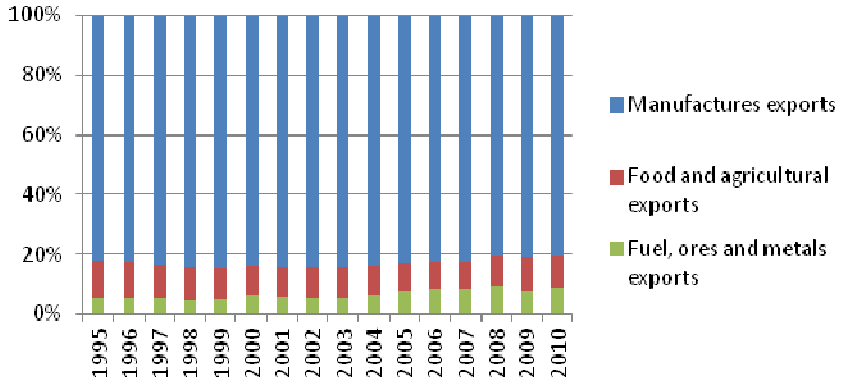
Source: UNCTADstat, accessed in June 2012 at http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx.

Notes: 1) HII - Product as measured by the Herfindahl-Hirschman index in UNCTADstat.

2) Data refers to simple average across the EU23 countries.

Disaggregating EU23 exports into Manufactures, Food and agriculture and Fuel, ores and metals (Figure 3), we can see a clear difference between the first sector and the other two. Manufactures exports represent about 80% of the merchandise exports, but have been exhibiting a declining trend in recent years due to the increase in the exports of Fuel, ores and metals.

Figure 3: EU23 - Exports structure by sector, 1995-2010



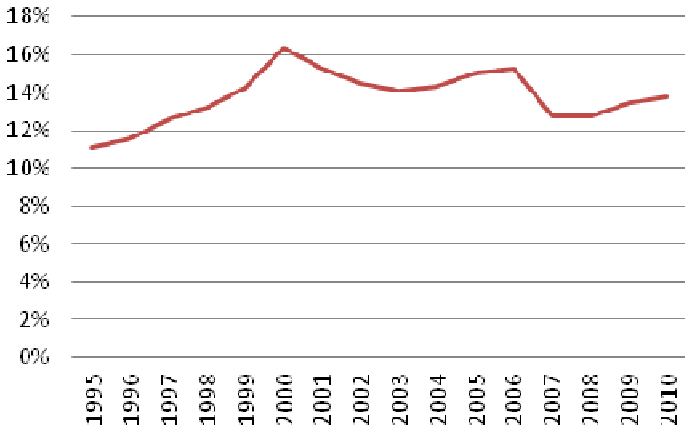
Source: Own calculations based on data from World Development Indicators, accessed in June 2012 at http://data.worldbank.org/data-catalog/world-development-indicators.

Note: Data refers to simple average across the EU23 countries.

In particular, within exports of Manufactures, the high-technology exports have reached the highest shares in 2000 and 2006 accounting for about 14% of Manufactures exports in 2010 – see Figure 4. According to the results of our model, the larger the growth/weight of manufactured exports and the larger the high-technology component of manufactured exports, the larger the economic growth. Thus, the EU23 countries should consider increasing exports in these sectors by focusing on products for which they have increased competence.

Disaggregating the European exports by product (Figure 5), we can confirm that, on average, Machinery and transport equipment has the greatest weight (representing around 45% of Manufactures exports), followed by Medicinal and pharmaceutical products (8.50%). Given stronger comparative advantages in Machinery and transport equipment, products within these groups should be the main engine for exports growth, namely through technological reinforcement (recall the "product proximity" idea in Bonaglia and Fukasaku, 2003).

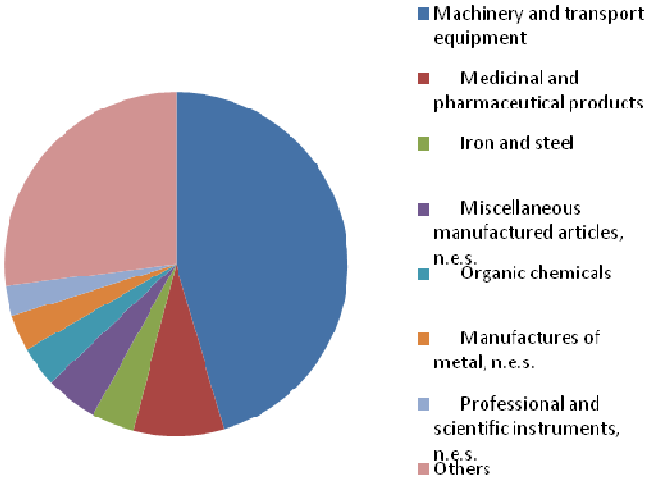
Figure 4: EU23 - High-technology exports (% Manufactures exports), 1995-2010



Source: World Development Indicators, accessed in June 2012 at http://data.worldbank.org/data-catalog/world-development-indicators.

Note: Data refers to simple average across the EU23 countries.

Figure 5: EU23 - Structure of manufactured exports, 2010

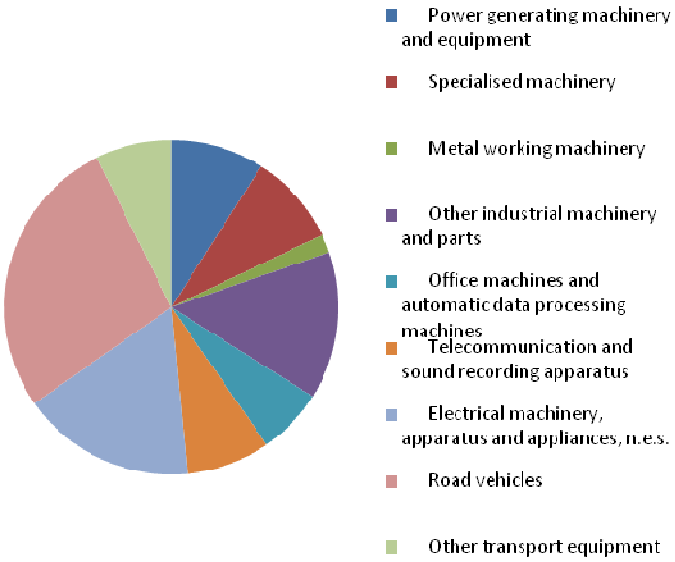


Source: UNCTADstat, accessed in November 2012 at http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx.

Note: Product classification based on SITC, Rev.3.

In particular, Machinery and transport equipment includes Road vehicles (27.41%), Electrical machinery, apparatus and appliances (26.78%), Other industrial machinery and parts (14.29%) and Power generating machinery and equipment (9.04 %) – see Figure 6.

Figure 6: EU23 - Structure of machinery and transport equipment, 2010



Source: UNCTADstat, accessed in November 2012 at http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx.

Note: Product classification based on SITC, Rev.3.

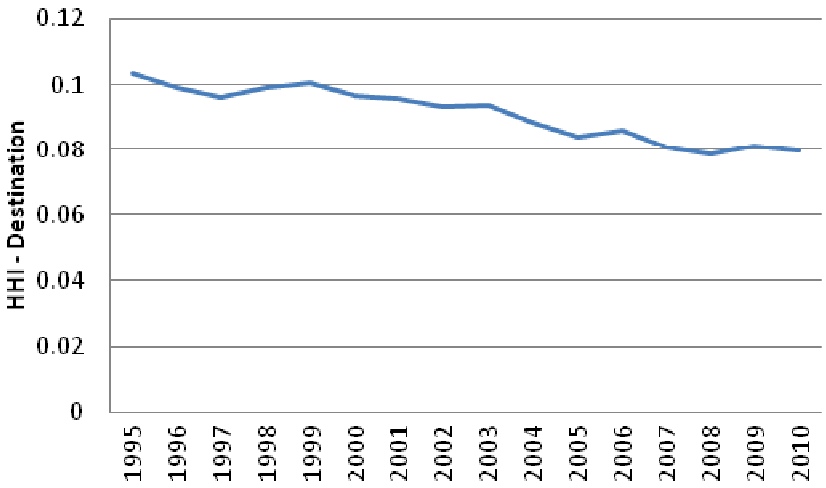
Besides the diversification of destinations (on average, countries have more 20 trading partners in 2010 relative to 1995)[2], Europe has also diversified the volume of exports within trading partner as Figure 7 shows a decreasing path of the average HHI-destination. Thus Europe has been heading towards a larger diversification of export destination – either through new exporting markets or through reorganizing their export volumes across existing partners. In particular, the latter trend is consistent with greater economic growth, reducing the dependency relative to idiosyncratic shocks.

Figure 8 confirms the recent tendency to diversification within partners, by reducing the weight of some of the major markets such as Germany, France, United States and the United Kingdom, while increasing the exports to countries like China, Poland, Russian Federation and Czech Republic.

[2] Source: http://data.worldbank.org/data-catalog/world-development-indicators.

Moreover, positive contribution to growth was reinforced as this shift was towards markets with greater potential demand growth (see Figure 9).

Figure 7: EU23 - Destination concentration of exports, 1995-2010

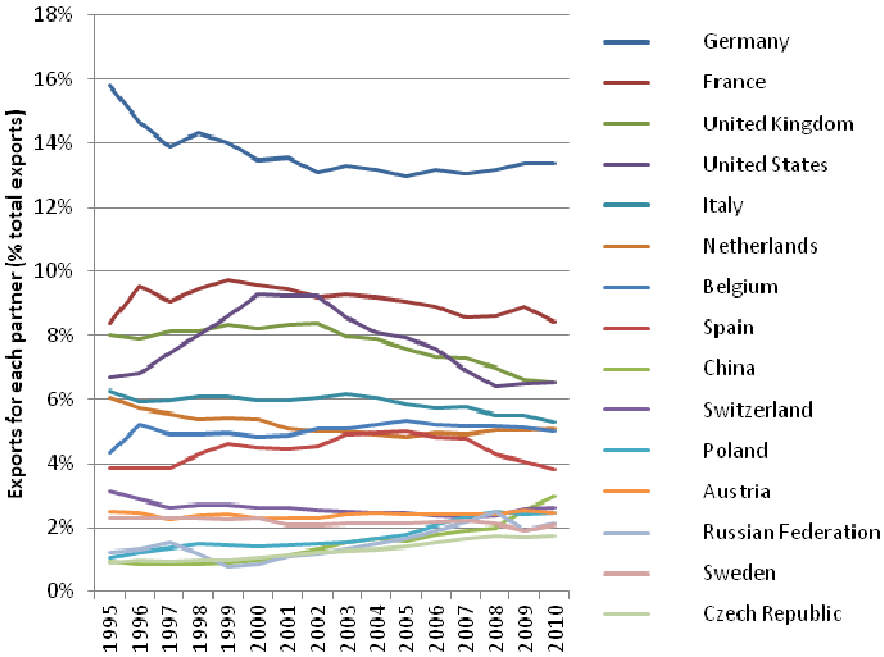


Source: Own calculations based on data from UNCTADstat, accessed in June 2012 at http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx.

Notes: 1) HII - Destination as measured by the Herfindahl-Hirschman index.

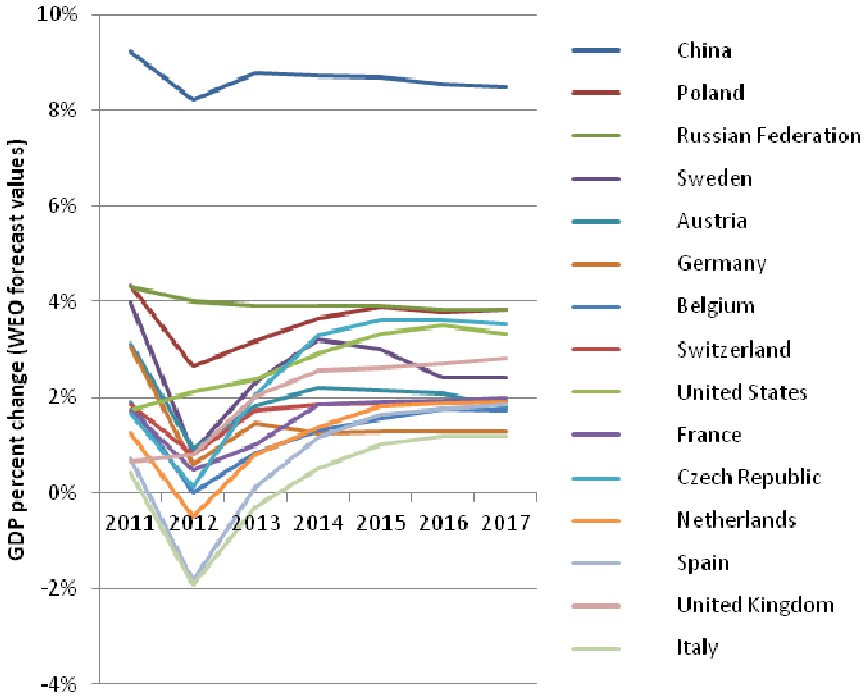
2) Data refers to simple average across the EU23 countries.

Figure 8: EU23 - Relative importance of main trading partners, 1995-2010



Source: UNCTADstat, accessed in November 2012 at http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx.

Figure 9: EU23 - GDP growth forecasts for main trading partners, 2011-2017



Source: World Economic Outlook, WEO, accessed in November 2012 at http://www.econstats.com/weo/V002.htm

4. Conclusions

After reviewing, both empirically and theoretically, the channels through which exports affect economic growth, especially through product structure and destination, we have assessed how these dimensions impinge on the economic growth of the EU. We have estimated a Solow-decomposition growth model augmented with several dimensions capturing the literature-enlightened aspects of product structure and destination of exports. The model is estimated using annual data for a panel of 23 EU countries across 1995 to 2010. Relative to existing literature, our model improves on including, simultaneously, several dimensions of both product and destination structure of exports and also in focusing in the EU set of developed countries.

Our results report a rather well-specified and robust model which delivers a strong relationship between real exports' growth and real output growth. The results suggest that where to and what to export do matter for the EU growth dynamics. In particular, our results lend support to that

rich/developed countries should export more value-added products, with special focus on high technology exports. Better economic growth performance is also enhanced if countries specialize rather than export a large set of products, a result in line with the comparative advantage hypothesis. Moreover, we find evidence that higher growth is fostered by export diversification across partners while enlarging the portfolio of partners, mainly to less developed and more distant countries, has negative impacts on European growth. Unambiguously, and as expected, relative concentration of exports should be directed towards the trade partners that exhibit higher potential growth rates: the larger the weighted average growth rate of trading partners, the stronger the leverage effects to economic growth.

Given these conclusions, the European countries should support high technology exports and should reinforce the exports of *Machinery and Transport Equipment*, *Medicinal and pharmaceutical products* and *Iron and Steel*. Moreover, a move towards more diversification among trade partners is desirable, namely from the most representative in the export portfolio – Germany, France, the UK and the US - to the less representative and with higher growth potential such as China, Poland and Russian Federation.

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http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx

Annex A - Partner's growth index (%)

Country / Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Austria	1.94	1.31	2.31	2.28	2.37	3.49	1.82	1.07	1.03	2.38	1.95	3.68	3.43	1.22	-4.51	2.75
Cyprus	1.83	0.19	1.35	1.72	2.38	3.99	2.10	1.88	2.40	3.12	1.64	2.90	3.26	0.29	-3.78	0.48
Czech Republic	2.32	2.08	2.81	2.49	2.33	3.18	1.57	0.85	0.83	2.15	1.84	3.71	3.82	1.38	-4.25	2.78
Denmark	2.21	1.81	2.87	2.54	3.00	3.79	1.52	1.10	1.20	2.63	1.95	3.18	3.11	0.03	-4.40	2.79
Estonia	1.18	1.52	3.80	2.99	3.55	4.61	2.69	2.44	3.01	4.29	3.65	4.96	5.41	0.48	-8.02	2.83
Finland	2.22	1.78	3.26	2.55	3.19	4.36	1.92	1.64	2.23	3.46	2.76	4.09	3.78	0.77	-4.41	3.10
France	2.12	1.79	2.73	2.79	2.73	3.55	1.49	0.89	1.03	2.08	1.71	2.94	2.86	0.18	-4.04	2.46
Germany	2.34	2.01	2.89	2.75	3.03	3.73	1.41	1.24	1.53	2.83	2.37	3.27	3.19	0.65	-3.50	2.48
Greece	2.73	1.25	1.57	2.43	2.73	4.16	1.70	1.65	1.80	3.22	2.48	3.67	3.49	1.60	-4.24	1.93
Hungary	1.59	1.25	2.18	2.16	2.57	3.44	1.58	0.88	0.95	2.43	1.91	4.00	4.03	1.71	-4.90	2.31
Ireland	2.05	1.82	2.71	2.70	2.95	3.43	1.39	1.00	1.09	2.19	1.48	2.20	2.21	-0.60	-4.32	1.81
Italy	1.87	1.63	2.63	2.46	2.79	3.61	1.40	1.13	1.37	2.70	2.13	3.38	3.23	0.75	-3.74	2.35
Latvia	-0.35	0.33	3.54	2.59	2.89	4.55	2.93	2.48	3.30	4.25	4.22	5.83	5.96	1.06	-8.44	2.82
Lithuania	-1.60	0.12	3.93	2.03	3.14	5.08	3.45	2.92	3.15	4.64	4.41	6.06	5.80	1.15	-6.81	2.95
The Netherlands	1.90	1.25	2.49	2.49	2.73	3.40	1.32	0.69	0.55	1.92	1.21	2.68	2.54	0.05	-4.35	2.26
Poland	1.13	0.57	1.93	1.75	2.44	3.66	2.12	1.20	1.43	2.74	2.11	3.84	3.63	0.90	-5.40	2.50
Portugal	2.11	1.76	2.57	2.76	2.97	3.45	1.51	0.94	0.75	1.92	1.95	3.00	3.24	0.57	-4.14	0.87
Romania	1.75	1.12	2.43	2.06	1.94	3.80	1.41	1.02	0.99	2.60	2.10	3.33	2.76	0.70	-4.93	2.46
Slovakia	3.09	2.09	1.43	1.77	2.43	3.72	2.01	1.15	1.19	2.67	2.47	4.06	3.45	1.42	-4.60	2.31
Slovenia	2.59	3.52	3.88	2.63	2.35	3.60	1.72	1.39	1.43	2.58	2.10	3.65	3.41	1.24	-4.66	1.96
Spain	1.92	1.63	2.54	2.87	2.61	3.38	1.38	0.57	0.47	1.93	1.19	2.40	2.22	-0.19	-3.84	1.81
Sweden	2.35	2.31	3.26	2.69	2.87	3.57	1.45	1.00	1.21	2.57	1.96	2.87	2.95	0.23	-3.98	2.05
United Kingdom	2.43	2.11	3.22	2.52	3.35	3.75	1.16	0.91	1.03	2.35	1.81	2.67	2.44	-0.43	-4.14	2.09

Annex B - General descriptive statistics

	Average across countries	*Std. Dev. across countries*	*Max*	*Min*	*Obs.*
GDP growth	2.69	3.72	13.06	-17.37	368
Gross capital formation	22.74	4.63	40.39	10.61	368
Population growth	0.28	0.62	2.18	-1.79	368
Inflation	5.12	10.5	154.76	-4.48	368
Number of partners	190.12	24.42	218	91	368
Partners' growth	1.87	2.05	6.06	-8.44	368
HHI - product	0.12	0.05	0.29	0.04	368
High technology exports	10.07	7.7	41.84	0.36	368
Manufactures exports	75.24	11.91	90.27	44.56	368
Food and agricultural exports	0.31	0.95	10.75	-2.43	368
Fuel, ores and metals exports	0.31	1.04	7.67	-7.01	368
HHI - destination	0.09	0.03	0.2	0.04	368